MAP MF-1970-A



Granitic rocks Kuiu-Etolin belt ultramafic rocks Teg

TKg

Kag

Kwg Kku Mainland and Alexander belts Alexander belt

CORRELATION OF MAP UNITS

#### Table 1.—Description of geologic map units and measured density data [Metamorphic equivalents of KJs, Mzu, MzPzu, Pzsv, and Pzl are included within these units. Generalized rock unit symbols modified from Brew and others (1984). Density data in g/cm<sup>3</sup>]

Generalized rock unit symbol	Age, rock types, and [belt]	Included units from detailed geologic map (Brew and others, 1984)	Number of density samples	Minimum density	Maximum density	Average density	Standard deviation
		Sedimentary and volcanic ro	cks				
QTv	Late Tertiary and Quaternary sedimentary and volcanic rocks (Quaternary surficial deposits not included) [Kuiu-Etolin belt]	Qs, Qb, QTv, QTc, QTr, QTf, QTa, QTb, QTx, Tmd, Tmgb	28	2.28	2.95	2.70	0.11
KJs	Late Jurassic to Early and (or) mid-Cretaceous [Gravina belt] flysch and volcanic rocks and metamorphic equivalents	Tsh, Ksg, Kss, Ksp, KJsv, KJss, Ksm	62	2.69	3.20	2.76	.12
Mzu	Late Mesozoic undivided greenstone, chert, phyllite, melange (including exotic blocks) [Gravina belt]	Mzm, Mzs, Mzl, Mzv, Mzc, Mzr, Mzp, Trhp, Trhv, Trhs, Tp, Dls	18	2.56	3.06	2.80	.18
MzPzu	Permian to Late Triassic sedimentary and volcanic rocks, and limestone [upper Alexander belt], and metamorphic equivalents [Mainland belt]	TKp, TKbs, TKhs, TKmb, TKbg, TKhg, Trhh, Trhl, Trhc, Trhb, Trk, Pp, Phl, Phb	40	2.53	2.93	2.73	.09
Pzsv	Ordovician to Mississippian sedimentary and volcanic rocks and related conglomerate [lower Alexander belt] and metamorphic equivalents	Cl, CDs, MDc, MDcv, Dl, DSva, DSvg, DSvb, Stbg, Stbc, Stbl, Stbv, Stpg, Stpc, SOtdg, SOtdl, Tbh, Kbln, Kdh, Koh, Kpch	94	2.63	2.94	2.72	.06
Pzl	Silurian limestone and related conglomerate and metamorphic equivalents [lower Alexander belt]	Khh, Koh, Sck, Sckc, Sch, Schc Scp, Stbo, Kch	15	2.68	2.96	2.77	.09
		Intrusive rocks					
Tmg	Late Tertiary granitic and related rocks [Kuiu-Etolin and Mainland belts] (about 20 Ma)	Tmae, Tmge, Tmme, Tmaz, Tmgk, Tmdk, Tdr, Tag	9	2.49	2.83	2.63	.12
Teg	Mid-Tertiary granitic rocks and associated migmatite [Mainland belt] (about 50 Ma)	Tmgz, Tmgy, Tgdb, Tgdp, Tgrg	10	2.65	2.73	2.69	.03
TKg	Latest Cretaceous to Earliest Tertiary granitic rocks [Mainland belt] (about 60 Ma)	Tmgx, Ttos, Tgdg	14	2.68	2.82	2.79	.04
Kag	Late Cretaceous granitic rocks [Gravina and Mainland belts] (about 90 Ma)	Kmgf, Ktef, Ktif, Ktop, Ktoc, Kqop, Ktgp, Kgo, Kdi	23	2.52	2.87	2.72	.08
Kwg	Mid-Cretaceous granitic rocks [lower Alexander and Gravina belts] (about 100 Ma)	Kwgd, Kwgo, Kwan	13	2.60	2.85	2.71	.09
Kku	Mid-Cretaceous ultramafic and mafic rocks [lower Alexander and Gravina belts] (100-110 Ma	Kbdu, Kbwh, Kbgb, Kbgd, Kuk, Khb, Mzgb, Mzq, Mzum	8	2.51	3.24	2.90	.24

Gravity contours—Showing complete Bouguer anomaly in milligals. Dashed where data are incomplete. Hachures indicate areas of low gravity. Contour interval 5 milligals Anomaly—Letter refers to discussion in text Measurement location—Number above symbol indicates complete Bouguer gravity in milligals. Number below symbol indicates pecific gravity of sample collected Geologic contact—Dotted where concealed ---- Limit of geologic mapping

This complete Bouguer gravity map of Petersburg and parts of Port Alexander, Sitka, and Sumdum quadrangles shows a gravity field that is characteristic of much of southeastern Alaska. Within the mapped area, the gravity changes from high Bouguer anomalies measured on the continental shelf, to low anomalies in the high mountains along the Alaska-Canada boundary. The change is not continuous but consists of two zones of steep gradients that border a belt or shelf of relatively flat gravity field. These contrasting areas coincide with the four principal tectono-stratigraphic terranes inferred in this part of Alaska by Berg and others (1978). Within the flat field and elsewhere on the map, a few local anomalies correlate closely with intrusions and geologic structures.

# GRAVITY DATA

Most of the gravity data in the mapped area was obtained by skiff traverses during the summers of 1968 and 1969. The initial results were reported as simple Bouguer anomalies by Barnes (1972a, b, c, d,) and Barnes and others (1972a, b). A few earlier 1975 completed the shoreline coverage (Barnes and others, 1975). The map includes additional and previously unpublished data obtained from helicopter flights during the fall of 1981. Away from the shoreline, the present gravity coverage is only of reconnaissance nature where station spacings are typically 5 to 10 km, and large areas have even less coverage in the high mountains near the international boundary. Dense vegetation and poor weather limited the opportunities to collect additional data. The earlier gravity data (1972) were based on the Potsdam gravity datum and the 1930 international gravity ellipsoid, but calculations for the Bouguer gravity map of Alaska (Barnes, 1977) showed new anomalies based on the international gravity standardization net (I.G.S.N. 71) (Morelli and others, 1974) and the 1967 geodetic reference system (International Association of Geodesy, 1971), which were also used for compiling the present map. The datum change decreases the observed gravities by about 14.50 mGal,

and the combined datum and ellipsoid changes decrease the Bouguer anomalies by about 6.8 to 7.0 mGals in this part of Alaska. Additional data for the Petersburg quadrangle may be placed on the same datum by occupation of any of more than two dozen gravity base stations that were described by Barnes (1972c). In addition, two previously undescribed stations in the area are located at

from the waiting room to a parking lot and at the northeast corner of the bottom concrete slab, where the gravity is 981,652.96 mGals on the IGSN-71 datum. (2) Station WRNF--Wrangell airport, at the new terminal, at the foot of the oncrete steps leading from the waiting room to the parking lot and at the northeast corner of Kupreanof Island. This gravity high was measured along the shoreline and in part of the bottom concrete slab, where the gravity is 981,600.95 mGals on the IGSN-71 datum. reflects the mafic rocks (Kku), which crop out on Turn Mountain south of the shoreline. to mean-tide level using data from the Pacific Coast tide tables (National Oceanic and and its associated aeromagnetic anomaly (U.S. Geological Survey, 1979), but the magnetic Atmospheric Administration, 1968-1975). Such elevations have an estimated accuracy better than 1 m. Altimetry was used for most of the remaining elevation control, although measurements had been made by Thiel and others (1958), and later a few skiff traverses in a few stations were placed at vertical angle bench marks. The accuracy of the altimetry is estimated to be within about 5-10 m, and the bench marks have a precision similar to the of the map. Although the belt includes some gravity relief of about 5 to 10 mGal, none of sea-level control. Baseline gravity measurements were also made at many tidal bench marks so that potential gravity changes associated with the regional uplift of southeastern Alaska (Hicks and Shofnos, 1965) may be measured and analyzed at some later date. The Bouguer gravity data on this map have been corrected for terrain to a radius of 99 km by using the computer program of Plouff (1977) and terrain data obtained from digital elevation model (DEM format) magnetic tapes (Barnes, 1984b; Elassal and Caruso, 1983). This digital elevation model shows all marine areas as having zero elevation, so with the outcrop, but it does coincide with a narrow linear magnetic anomaly (U.S. the bathymetric part of the terrain correction has been neglected as have the effects of Geological Survey, 1979) that is probably caused by outcropping volcanic rocks (QTv). glaciers and lakes, but the resulting errors are believed to be less than one milligal.

elevations estimated from Canadian topographic maps (scale, 1:250,000).

the following similar locations outside new air terminals:

The large spacing (5-10 km) between gravity stations away from the shoreline does not provide sufficient station density for accurate contouring, so the present contouring is subjective because it was supplemented by both the geologic and aeromagnetic maps. A digital computer first calculated the complete Bouguer anomalies and then plotted, gridded, and finally contoured the data. The resulting computer plot tended to show arcs through data gaps where other data suggested the contours should be linear. The plotted values were recontoured using the computer-contour, the aeromagnetic, and the geologic maps for guidance. If a high or low gravity value appeared to be associated with an aeromagnetic anomaly or geologic unit, the contours parallel the outline of the anomaly or unit, because those maps were compiled from more closely spaced observations.

The generalized geology shown on this map is a simplified version of a recent compilation of approximately the same area by Brew and others (1984), whose 153 geologic units were combined to form the 12 units on this map. Table 1 shows which of the original units are included in each of the simplified units used as a basis for the geophysical interpretations. The sedimentary and volcanic rocks range in age from early Paleozoic to Tertiary and Quaternary units. For further simplification, the 12 units were classified into four principal belts, one of which is younger and partly overlies the older belts (fig. 1). From oldest to youngest and approximately from west to east these belts are: (1) the Alexander belt, composed of generally unmetamorphosed lower Paleozoic through Upper Triassic rocks; (2) the Gravina belt, composed of unmetamorphosed to amphibolite and hornblende-hornfels

facies of Upper Jurassic(?) through mid-Cretaceous flysch and volcanic rocks; (3) the Mainland belt, composed of metamorphic rocks mostly of indeterminate age; (4) the younger, partly overlying, Kuiu-Etolin belt, composed of primarily volcanic rocks of lower to middle Tertiary age. Plutons compose significant parts of each belt and have been separated into six different age groups. The oldest mid-Cretaceous intrusions (Kku) are present only in the older Alexander and Gravina belts. However, the concentration of younger Late Cretaceous and most Tertiary intrusions in the Mainland belt suggests direct relations between the intrusions and the metamorphism. Mafic and ultramafic plutons are present in both the Alexander and Gravina belts but not in the Mainland belt in this area. Structural relations between the belts are still poorly known, but the Alexander and Gravina belts approximately coincide with the tectono-stratigraphic terranes of the same names (Berg and others, 1978). The Mainland belt is now considered equivalent to the Taku and Tracy Arm terranes of Berg and others (1978) and may also be a metamorphosed equivalent of the Alexander belt (Brew and Ford, 1983). Several major faults and lineaments trend north-northwest across the project area, but probably the most prominent features in the geophysical data are the Coast Range megalineament (Brew and Ford, 1978) and the Duncan

### DENSITY DATA

Canal fault (see geologic base).

Density measurements (summarized in table 1) were made on more than 300 samples collected during the gravity field work and the geologic mapping. Most of the sample sites and measured densities are shown on the map. More than two thirds of the samples were collected during the gravity field work, but because this sampling did not provide an adequate representation of all the generalized geologic units, additional samples collected by the geologists were also measured. In some cases, rock samples were collected at points so close together that their individual densities could not be plotted on this map, and in these areas some measurements have been omitted for clarity. All density measurements were made by comparing specimen weights in air and water as measured by an electronic balance. No special efforts were made to eliminate or correct for the effects of porosity, but the high measured density values suggest that porosity effects are negligable in most southeastern Alaskan specimens.

The data (table 1) suggest that the mean density of all the rocks in the mapped area is close to 2.74 g/cm<sup>3</sup>, which is significantly higher than the standard reduction density of 2.67 g/cm<sup>3</sup> but close to mean densities measured in other parts of southeastern Alaska (Barnes, 1977, and 1984a). The standard reduction density (2.67 g/cm<sup>3</sup>) has been used for this map because the large proportion of shoreline data suggests that the elevation correction is not significant in most of the data reduction, although the difference could amount to almost a contour interval in some of the higher stations Only three rock groups have mean densities that differ by more than 0.05 g/cm<sup>3</sup>

from the 2.74-g/cm<sup>3</sup> mean of all rock units. Thus, these three units, the 20-Ma granites, the mafic and ultramafic rocks, and the late Mesozoic greenstones of the Gravina belt, are probably associated with observable gravity anomalies. However, inspection of the map suggests that even these three rock units do not have consistent gravitational expression. Although structure and thickness of the rock units contribute to this inconsistency, much of it may also be explained by the variability of densities within individual rock units. The standard-deviation values (table 1) suggest that the variability within individual rock groups, and especially the three groups with anomalous density means, exceeds the amounts by which these mean densities differ from the mean densities of other units. This suggests that, from a density standpoint, the rock groupings could be better defined, but interpretation of the map also suggests that much of the gravity field is flat ind indicative of low density contrast. On the basis of density data (table 1), we conclude that the larger anomalies are associated with the 100- to 110-Ma mafic and ultramafic

### REGIONAL GRAVITY INTERPRETATION

Two obvious features of the gravity map are the areas of closely spaced northwesttrending contours in the southwest and northeast corners of the map. Both of these zones represent crustal thickening to the northeast associated with the continental margin in the southwest and the edge of the Coast Mountains in the northeast. Between these two zones the gravity field is much flatter and is marked by elliptical closures or east-west-trending contours. In this central 50- to 75-km-wide belt, the gravity relief does not exceed 2 mGal, and the flatness of the gravity field makes contouring difficult between the widely spaced stations. However, many of the anomalies seem to be correlated with features on the geologic and aeromagnetic maps, and the latter was helpful in guiding the contouring. The major features of the gravity field are shown in a profile (fig. 2) of the complete Bouguer anomaly field between Point Howard at the southwest corner of the map to LeConte Glacier near the northeast corner of the map as shown in fig. 1. northeastward extension of the profile is not possible because of lack of data in the higher Coast Mountains and in Canada, but data from other parts of Alaska (Barnes, 1977) suggest that the gravity minimum is approximately -125 mGals and is present in the high Coast Mountains near the international boundary. The flatness of the gravity field between the western shore of Sumner Strait and the eastern shore of Duncan Canal is clearly shown. The mean Bouguer anomaly in this central belt is about 5 mGal, which according to the empirical relation of Woollard and Strange (1962) suggests a crustal thickness of about 30 km below the southeastern Alaska archipelago. Southwest of Sumner Strait the Bouguer anomaly begins to increase reaching a maximum of about 250 mGal (Barnes, 1977), which suggests a crustal thickness of less than 10 km beneath the Pacific Basin (Woollard and Strange, 1962). However, in oceanic areas the free-air gravity is sensitive to water depth and thus shows a small decrease over the entrance (-20 km on the profile) and a sharp decrease at the beginning of the continental slope (about -60 km). At the northeast end of the profile a minimum Bouguer gravity anomaly of about -125 mGal, which was measured elsewhere on the southeastern Alaska-Canada boundary, suggests a crustal thickness of about 45 km below the crest of the Coast Mountains. Although the data have not been modeled, the centers of the gradients suggest that the transition from oceanic to archipelago crustal thickness is centered beneath the crest of the continental slope, and the transition from archipelago to Coast Mountain crustal thickness may be east of but close to the location of the Coast Range megalineament.

# INTERPRETATION OF LOCAL GRAVITY ANOMALIES

The zone of flat gravity contains most of the smaller gravity anomalies that can be correlated with plutons and geologic structures, although such features also influence the linearity of the contours marking the flat-field boundary. These smaller anomalies are briefly discussed below from west to east across the mapped area. At the southwest corner of the map, the contours marking the oceanward decrease in crustal thickness seem at first glance to be remarkably linear. However, a northward flexure of the 30-mGal contour south of Port Malmesbury (anomaly A) indicates a small gravity high associated with the mid-Cretaceous quartz-monzodiorite pluton (Kwg) that crops out south of the port. Similar rocks also crop out farther south between Kell Bay and Howard Cove, but none of the gravity measurements are sufficiently close to the outcrop to clearly define an associated gravity anomaly. However, detailed inspection of gravities observed at nearby stations suggests a small high. The density data (table 1) suggest that rocks of these plutons are slightly less dense than the Paleozoic graywackes and associated turbidites that they intrude. However, the samples include rocks from other areas, and the data are not sufficiently local to establish a density contrast to use in thickness calculations. A similar pluton crops out at the north end of the Kuiu Island, 5 km southwest of Security Bay, where it causes enough of an anomaly to show a slight eastward flexure of the 20-mGal contour (anomaly B). However, no gravity stations are sufficiently close to the outcrop to really measure the magnitude of the anomaly associated with the pluton. A distinct anomaly (C) is present over a possibly much younger pluton (Tmq) that crops out a little southward and just east of Washington Bay. The age of this granitic pluton is inferred to be 20 Ma, which suggests that it contains the lightest rocks in the mapped area (table 1). The positive anomaly suggests that either the deeper parts of the pluton are more mafic than the outcrop or that the age of this pluton has been incorrectly inferred. The dimensions of the pluton cannot be estimated without a better knowledge of the density contrast that causes the anomaly

An even more puzzling anomaly (D), which because of similar amplitude and proximity seems to be related to the above anomaly, lies to the southeast and crosses the head of the Bay of Pillars. This anomaly has double single-station peaks suggesting twin intrusions, but it lies considerably northwest of the nearest igneous intrusive outcrop, which is southwest of Threemile Arm. As a further complication, an aeromagnetic anomaly (U.S. Geological Survey, 1979) is centered south of both gravity anomaly D and the intrusive outcrop and approximately coincides with the southeastward extension of gravity anomaly D as indicated by the 20-mGal contour (anomaly E). Anomaly D is interpreted from four measurements made on separate days, so it does not result from an erroneous measurement. The most logical explanation for the separated gravity and aeromagnetic anomalies is that they reflect different physical properties of a complex and possibly composite intrusion. Another large aeromagnetic anomaly is present to the north, just southeast of Saginaw Bay, where it is not associated with any plutonic outcrop. Here the gravity relief is small, but there is a suggestion of a gravity high (anomaly F) with a magnitude of 5 to 10 mGal. No gravity measurements were made near the center of this In the northwest corner of the map, the small gravity lows (anomaly G) on the south shore of Admiralty Island coincide with outcrops of Tertiary sedimentary rocks of the

Kootznahoo Formation. Most of the density samples for this group of rocks (QTv) are volcanics, which tend to be denser than the sandstones and conglomerates of the same age, (1) Station PETF--Petersburg airport, new terminal, at the foot of concrete steps so the indicated density contrast (table 1) is probably too low. Nevertheless, the small magnitude of the gravity relief (4 to 8 mGal) suggests a sedimentary thickness of less than To the southeast, a broad but low gravity high (anomaly H) covers the northwest

Elevation control for most of the shoreline data was based on sea level corrected The east-west width of the gravity anomaly is significantly broader than both the outcrop map suggests that the western part of the gravity high is caused by a separate but smaller intrusive body concealed beneath Pinta Rocks. South of this anomaly, a broad belt of flat gravity extends to the south boundary the anomalies can be clearly correlated with geologic outcrops or with aeromagnetic anomalies. The exception is a small gravity high (anomaly I) east of Big John Bay where it may be caused by the Tertiary gabbroic intrusives (QTv). The aeromagnetic map suggests that such rocks are not extensive. To the southeast, another small gravity high (anomaly J) was measured about halfway between Totem Bay and the outcrop of a small Tertiary intrusive (QTv) southwest of Castle River. The gravity high does not correlate The broad gravity low over Sumner Strait (anomaly K) could be caused primarily by lack of Elevations in Canada were obtained either from the digital elevation model or from average the bathymetric part of the terrain correction, although a thick layer of bottom sediments

On northwestern Prince of Wales and northern Kosciusko Islands, a gravity high anomaly L) and a gravity low (anomaly M) both seem to correlate with outcrops of middle Cretaceous granitic rocks (Kwg), but here also, the correlation between gravity contours, outcrop pattern, and magnetic anomaly pattern is poor. The present contour pattern suggests that the northern part of the granitic unit (Kwg) is denser than the surrounding limestone and associated sedimentary rocks and that the southern part is less dense than the rocks it intrudes. This difference in gravitational expression could be explained by either differences within the pluton or within the country rock, but the density data (table 1) do not account for the difference.

Farther east, a much smaller gravity high at Blashke Islands (anomaly N) is easily correlated with geologic and aeromagnetic data. The anomaly has an amplitude of at least 10 mGal, but the measurement showing this anomaly was made on the east edge of both the outcrop and the aeromagnetic anomaly. A measurement closer to the center of the outcrop might record a significantly higher anomaly. Nevertheless, infinite-slab calculations using the 10-mGal amplitude and the 0.18-g/cm3 density contrast (table 1) indicate a minimum

pluton thickness of 1.3 km. The proximity of this measurement to the east edge of the outcrop suggests that the mimimum thickness could be at least 3 km or higher. At the northwest corner of Etolin Island, another broader gravity high (anomaly (1) of 10- to 15-mGal amplitude is centered on Steamer Bay. This gravity high approximately coincides with aeromagnetic anomalies and the outcrops of the Brothers Islands and Douglas Island volcanic rocks. These volcanic rocks are not distinguished from sedimentary rocks in the same Lower Jurassic to mid-Cretaceous flysch sequence (table 1) so the density contrast is unknown. However, an estimated density contrast of about 0.1 g/cm<sup>3</sup> would suggest that the anomaly could be explained by about a 2-km thickness of the volcanic rocks. Elsewhere in the quadrangle, other outcrops of the same volcanic rocks do not coincide with gravity highs, so the outcrop at Steamer Bay may represent the thickest

or densest accumulation of these rocks. Irregular contours over much of Etolin Island suggest many variations in thickness and density of its granitic rocks. A small oval closure of the 0-mGal contour on the south shore of Meter Bight (anomaly R) and an eastward flexure of the -10-mGal contour at Deep Bay (anomaly S) both on Zarembo Island, represent small gravity highs associated with known outcrops of the mid-Cretaceous mafic and ultramafic rocks. The southern anomaly has an amplitude of about 5 mGal and the northern about 2 mGal, which suggests that both bodies are small, although thickness estimates would not be justified without more detailed gravity coverage. northward flexure of the -15-mGal contour over southeastern Woronkofski Island shows another gravity high (anomaly T) caused by outcrops of similar ultramafic rocks (Kku) on the north shore of Circle Bay.

Northwest from these anomalies, a broad gravity high (anomaly U) occupies most of the southwestern part of Mitkof Island, where it approximately coincides with the northern end of the Sumner Mountains and another large magnetic high (U.S. Geological Survey, 1979). The same area includes an outcrop of a large mid-Cretaceous granitic pluton (Kag), but the pluton covers a much broader area than either the gravity or aeromagnetic anomalies (Andrew Griscom, oral commun., 1985). Furthermore, other outcrops of these mid-Cretaceous plutons do not seem to have either gravity or magnetic expression, so the cause of the anomaly is believed to underlie the pluton. The anomaly is thus presumed to be caused by a more mafic intrusion that may be unrelated to the exposed rocks. An elongate gravity low (anomaly V) was mapped over the central part of Duncan Canal where it seems to be associated with outcrops of Mesozoic metamorphosed schists, phyllites, and greenstones of the Gravina belt (Kag). The cause of the gravity low is uncertain, but it could represent fracturing, increased vesicularity of the volcanic rocks, or a change of sediment character. However, the four schist samples collected for density measurements from the vicinity of the gravity low had a mean density of 2.63 g/cm<sup>3</sup> or about 0.1 g/cm<sup>3</sup> lower than the mean of rocks within the quadrangle. The sampling is so small that the result could be coincidental, but it does suggest a possibility for estimating that the 5-mGal low may represent a thickness of about 1 km of rock of this density contrast. There is some correlation between the location of the low and the distribution of

significance and deserve more detailed study. North of this low an elongate gravity high has twin peaks (anomaly W), both of which coincide with magnetic highs and smaller outcrops of the late Cretaceous granitic plutons (Kag). These gravity peaks are along a trend that also includes the Sumner Mountains high (anomaly U), which is broader in area but has a similar amplitude. Like that anomaly, the two highs are interpreted as representing more mafic intrusives buried at shallow depths below the granitic plutons. An anomaly that lends support to this interpretation is a high of similar amplitude just east of the northern end of the elongate high. This anomaly (X) has similar magnetic expression (U.S. Geological Survey, 1979) and also coincides with the somewhat smaller outcrop of the Kane Peak ultramafic body. Infinite-slab calculations and a density contrast of 0.15 g/cm<sup>3</sup> suggest that the Kane Peak pluton has a minimum depth of 1 to 2 km, although approximations based on a vertical cylindrical model with the dimensions of the anomaly would tend to increase this depth by a factor of 2 to 3. On the Sukoi Islets and Frederick Point, small northeastward flexures of the -20- and -15-mGal contours (anomaly Y) suggest smaller gravity highs associated with other ultramafic plutonic outcrops.

geochemical anomalies (Cathrall and others, 1983), so its occurrence may have economic

These generally northwest-trending contours are part of the belt that marks the northeastward decrease in Bouguer gravity from about 0 mGal near Duncan Canal to nearly -100 mGal near the international boundary. Figure 1 suggests that the decrease is not lines but flattens northwest of Frederick Sound and then steepens at about -40 mGal near the edge of the Coast Mountains, the Coast plutonic metamorphic complex, and the Coast Range megalineament. North and south of the profile the contour map suggests that the flattening covers a broader belt that includes much of Frederick Sound and some of the high mountains. Within this flatter belt the -30- to -45-mGal contours meander across a belt that is nearly 20 km broad. Within the flatter belt, two southwestward extensions of low gravity coincide with LeConte Bay and the mouth of the Stikine River (anomaly Z). Both xtensions of low gravity probably represent thick sections of Cenozoic (probably quaternary) sediments in the buried valleys of these drainages. The gravity stations are too widely spaced to define the width of these buried channels, which are probably much narrower than the present contours suggest. The amplitudes of the anomalies suggest that the sediment-filled valleys must be quite deep. Even if the sedimentary fill has a low density of about 1.75 g/cm<sup>3</sup>, or 1.0 g/cm<sup>3</sup> less than the bedrock, the 15-mGal anomaly would by infinite-slab approximation suggest a total sedimentary fill of more than 0.3 km. This thickness is more than three times the water depth in Sumner Strait between Zarembo and Mitkof Islands, and thus, suggests a deep glacial scour at the mouths of the Stikine and Le Conte drainages or another deep sedimentary fill beneath Sumner Strait. The decrease or attening of the regional gradient across Frederick Sound may not represent a similar change in gradient of crustal thickening. In the southern part of the map, the flattening of the regional gradient is less evident and the gravity anomaly decreases more gradually from the 0-mGal to the -50-mGal contours. In the north, the previously discussed elongate gravity high along the northeast shore of Duncan Canal tends to steepen the western gradient and to emphasize the steplike nature of the gravity field. The regional gradient presenting the gradual thickening of the crust is obvious, but its local variations may reflect changes in the underlying geologic structure and the composition of plutons.

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